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09/882,208	06/13/2001	Robin Cheung	AMAT/3840/MD/COPPER/PJS	8450

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EXAMINER

NICOLAS, WESLEY A

ART UNIT PAPER NUMBER

1742

DATE MAILED: 06/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/882,208

Applicant(s)

CHEUNG ET AL.

Examiner

Wesley A. Nicolas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) 29-52 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 54-57 is/are allowed.
- 6) ☒ Claim(s) 1-28 and 53 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☒ Interview Summary (PTO-413) Paper No(s) 9.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-28 and 53-57, drawn to a method of adjusting an electrochemical bath, classified in class 205, subclass 81.
 - II. Claims 29-52, drawn to a method of electrochemical deposition, classified in class 205, subclass 291+.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different functions, namely the invention of Group I is directed to maintaining an electrolyte bath and the invention of Group II is directed to electrodeposition of a substrate from an electrolyte bath.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

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4. Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Todd Patterson on May 21, 2003, a provisional election was made **with** traverse to prosecute the invention of Group I, claims 1-28 and 53-57. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29-52 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

7. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the (elected) claims are directed.

The following title is suggested: "Method of conditioning electrochemical baths in plating technology".

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1-5, 7-8, 10-15, 17-27 and 53 are rejected under 35 U.S.C. 102(e) as being anticipated by Reid (U.S. 6,458,262 B1).

Claim 1 is rejected because Reid teaches a method of adjusting an electrochemical bath in an electrochemical deposition system, comprising identifying one or more constituents generated during the electrochemical deposition process (Fig. 4, numeral 403) and adding the one or more constituents to the electrochemical bath (Fig. 4, numeral 409).

Claim 2 is rejected because Reid teaches that the identifying one or more constituents generated during the electrochemical deposition process comprises:

- analyzing at least a portion of a first electrochemical bath to determine a first bath composition (col. 6, lines 22-63);
- analyzing at least a portion of a second electrochemical bath produced from utilizing the first electrochemical bath in an electrochemical deposition process to determine the second bath composition (col. 6, lines 51-67); and

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- comparing the first and second bath compositions to identify some of the one or more constituents generated in the electrochemical deposition process (col. 7, lines 63-67).

Claim 3 is rejected because Reid teaches that at least a portion of the first electrochemical bath is directed to a chemical analyzer (col. 7, lines 63-67), wherein the chemical analyzer module analyses the portion of the first electrochemical bath by a high-performance liquid chromatography (HPLC) process (col. 6, lines 63-67).

Claim 4 is rejected because Reid teaches that at least a portion of the second electrochemical bath is directed to a chemical analyzer (col. 7, lines 63-67), wherein the chemical analyzer module analyses the portion of the second electrochemical bath by a high-performance liquid chromatography process (col. 6, lines 63-67).

Claim 5 is rejected because Reid teaches that the first electrochemical bath is an electroplating bath (col. 1, lines 15-20: "electroplating").

Claim 7 is rejected because Reid teaches a method of adjusting an electrochemical bath in an electrochemical deposition process, comprising:

- a) providing a first electrochemical bath having a first bath composition (col. 1, lines 20-25);
- b) utilizing the first electrochemical bath in an electrochemical deposition process to form a second electrochemical bath having a second bath composition (col. 3, lines 1-29 and Fig. 1, numerals 103 and 105: electrolyte is recirculated);

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- c) analyzing the first and second bath compositions to identify one or more constituents generated in the electrochemical deposition process (Fig. 4, numeral 403 and col. 4, lines 20-35); and
- d) adjusting the one or more constituents to the first bath composition (Fig. 4, numeral 409).

Claim 8 is rejected because Reid teaches that the first electrochemical bath is an electroplating bath (col. 1, lines 15-20: "electroplating").

Claim 10 is rejected because Reid teaches that the electrochemical deposition process deposits a metal film on a substrate (col. 3, lines 15-22: "demascene").

Claim 11 is rejected because Reid teaches that the metal film comprises a conductive metal such as copper (col. 3, lines 15-22: "copper").

Claim 12 is rejected because Reid teaches that analyzing the first and second electrochemical bath compositions comprises directing at least a portion of the first and second electrochemical bath to a chemical analyzer (col. 7, lines 63-67).

Claim 13 is rejected because Reid teaches that the chemical analyzer module is used to analyze the portion of the first and second electrochemical baths by a high-performance liquid chromatography process (col. 6, lines 63-67).

Claim 14 is rejected because Reid teaches a method of adjusting an electrochemical bath in an electrochemical deposition system, comprising:

- a) providing a first electrochemical bath (col. 1, lines 20-25);
- b) analyzing at least a portion of the first electrochemical bath to determine a first bath composition (col. 6, lines 22-45);

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- c) utilizing the first electrochemical bath in an electrochemical deposition process to form a second electrochemical bath (Fig. 1, numerals 103 and 105: electrolyte is recirculated);
- d) analyzing at least a portion of the second electrochemical bath to determine a second bath composition (col. 6, lines 22-45);
- e) comparing the first and second bath compositions to identify one or more constituents generated in the electrochemical deposition process (Fig. 4, numeral 403); and
- f) adding the one or more constituents to the first bath composition (Fig. 4, numeral 409).

Claim 15 is rejected because Reid teaches that the first electrochemical bath is an electroplating bath (col. 1, lines 15-20: "electroplating").

Claim 17 is rejected because Reid teaches that analyzing the portion of the first electrochemical bath comprises directing the portion of the first electrochemical bath to a chemical analyzer module and analyzing the portion of the first electrochemical bath by a high-performance liquid chromatography process (col. 6, lines 63-67).

Claim 18 is rejected because Reid teaches that analyzing the portion of the second electrochemical bath comprises directing the portion of the second electrochemical bath to the chemical analyzer module and analyzing the portion of the second electrochemical bath by a high-performance liquid chromatography process (col. 6, lines 63-67).

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Claim 19 is rejected because Reid teaches that the electrochemical deposition process deposits a metal film on a substrate (col. 3, lines 15-22: "demascene").

Claim 20 is rejected because Reid teaches Reid teaches that the metal film comprises a conductive metal such as copper (col. 3, lines 15-22: "copper").

Claim 21 is rejected because Reid teaches that comparing the first and second bath compositions to identify one or more constituents generated in the electrochemical deposition process comprises comparing the analyses of the first and second electrochemical baths (Fig. 4, numeral 403).

Claim 22 is rejected because Reid teaches A method of adjusting an electrochemical bath for an electrochemical deposition process, comprising:

- a) providing a first electrochemical bath having a first bath composition (col. 1, lines 20-25);
- b) utilizing the first electrochemical bath in an electrochemical deposition process to form a second electrochemical bath having a second bath composition comprising one or more generated constituents (Fig. 1, numerals 103 and 105: electrolyte is recirculated);
- c) identifying at least some of the one or more generated constituents by analyzing the first and second bath compositions (Fig. 4, numerals 402 and 403); and
- d) adding an additive material having a composition that is substantially the same as at least some of the one or more generated constituents to a third electrochemical bath to form a fourth electrochemical bath (Fig. 4, numeral 409).

Claim 23 is rejected because Reid teaches that the third electrochemical bath has the composition of the first electrochemical bath (Fig. 4, true if plating bath does not need to be adjusted through 2 iterations).

Claim 24 is rejected because Reid teaches that identifying at least some of the one or more constituents generated during the electrochemical deposition process comprises: analyzing at least a portion of the first electrochemical bath to determine the first bath composition (col. 6, lines 22-45); analyzing at least a portion of the second electrochemical bath produced from utilizing the first electrochemical bath in the electrochemical deposition process to determine the second bath composition (col. 6, lines 22-45); and comparing the first and second bath compositions to identify at least some of the one or more constituents generated in the electrochemical deposition process (Fig. 4, numeral 403).

Claim 25 is rejected because Reid teaches that at least a portion of the first electrochemical bath is directed to a chemical analyzer, wherein the chemical analyzer module analyses the portion of the first electrochemical bath by a high-performance liquid chromatography process (col. 6, lines 63-67).

Claim 26 is rejected because Reid teaches that at least a portion of the second electrochemical bath is directed to a chemical analyzer, wherein the chemical analyzer module analyses the portion of the second electrochemical bath by a high-performance liquid chromatography process (col. 6, lines 63-67).

Claim 27 is rejected because Reid teaches that the first electrochemical bath is an electroplating bath (col. 1, lines 15-20: "electroplating").

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Claim 53 is rejected because Reid teaches a method of adjusting an electrochemical bath in an electrochemical deposition system, comprising:

- a) providing a first copper electroplating bath (col. 1, lines 20-25);
- b) analyzing a first portion of the first copper electroplating bath to determine a first bath composition by directing the first portion of the first copper electroplating bath to a chemical analyzer module and separating and identifying constituents of the first copper electroplating bath by a high-performance liquid chromatography process (col. 6, lines 63-67);
- c) utilizing a second portion of the first copper electroplating bath in a copper electroplating process to form a second copper electroplating bath (col. 6, lines 22-67);
- d) analyzing a portion of the second copper electroplating bath to determine a second copper electroplating bath composition by directing the portion of the second copper electroplating bath to a chemical analyzer module and separating and identifying constituents of the second copper electroplating bath by a high-performance liquid chromatography process (col. 6, lines 63-67);
- e) comparing the constituents of the first and second copper electroplating bath compositions to identify one or more constituents generated in the copper electroplating process (Fig. 4, numeral 403); and
- f) adding the one or more constituents generated in the copper electroplating process to the first copper electroplating bath (Fig. 4, numeral 409).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 6, 9, 16, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid (U.S. 6,458,262 B1), as applied to claims 2, 7, 14, and 22 above, and further in view of Hodgens, II ("Hodgens") (5,017,410).

Reid are as applied, argued, and disclosed above and incorporated herein but fail to specifically teach that the first electrochemical bath is an electroless bath.

Hodgens teaches that the first bath is an electroless bath (Abstract: "electroless").

Claims 6, 9, 16, and 28 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Reid to have the first bath be an electroless bath as taught by Hodgens because Hodgens teaches that the first electrochemical bath is an electroless bath (Abstract:

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“electroless”) which would have minimized the number of by-products produced from interactions between the bath and electrodes.

Allowable Subject Matter

13. Claims 54-57 are allowed over the prior art of record.

14. The following is a statement of reasons for the indication of allowable subject matter:

The specific method of adjusting an electrochemical bath for an electrochemical deposition process, comprising:

- a) providing a first copper electroless bath having a first bath composition;
- b) utilizing a portion of the first copper electroless bath in an electroless deposition process to form a second copper electroless bath having a second copper electroless bath composition comprising one or more generated constituents
- c) identifying at least some of the one or more generated constituents by determining the first and second copper electroless bath compositions, wherein identifying at least some of the one or more constituents generated during the electrochemical deposition process comprises:
 - o (i) analyzing a portion of the first copper electroless bath to determine the first bath composition;
 - o (ii) analyzing a portion of the second copper electroless bath to determine the second bath composition; and

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- o (iii) comparing the first and second copper electroless bath compositions to identify at least some of the one or more constituents generated in the electroless deposition process was not taught or suggested by the prior art of record.

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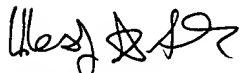
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley Nicolas whose telephone number is (703)305-0082. The examiner can normally be reached on Mon.-Thurs. from 7am to 5pm.

The Supervisory Primary Examiner for this Art Unit is Roy King whose telephone number is (703) 308-1146.

The fax number for this Group is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.



Wesley A. Nicolas

June 11, 2003